

## **Gut Bay, Kook, and Hoktaheen Lakes subsistence sockeye salmon stock assessment project 2002**

**Abstract:** Sockeye salmon (*Oncorhynchus nerka*) returning to Falls, Gut Bay, and Kutlaku Lakes are important traditional resources for the people of Kake. In 2002, Falls, Gut Bay, and Kutlaku Lakes were combined as the Kake Subsistence Sockeye Salmon Project to address concerns about increasing fishing pressure in these systems in the traditional areas around Kake. The project evaluates returning adult sockeye salmon populations to each lake along with the productivity of the freshwater environments and rearing juvenile sockeye salmon within them. This annual report summarizes the results of work conducted in 2002, the second field season at Falls and Gut Bay Lakes, and the first full field season at Kutlaku Lake.

In 2002, the return of adult sockeye salmon to Falls Lake was estimated for the second consecutive year through subsistence and sport harvest surveys, weir counts verified with a mark-recapture study, and an independent, spawning-grounds mark-recapture study. A portion of the escapement of adult sockeye salmon to Kutlaku Lake, specifically the part of the population spawning in the main inlet stream, was estimated through a mark-recapture study on the spawning grounds. In Gut Bay Lake, only visual counts of adult sockeye salmon were conducted. Age, length, and sex composition of the escapement in Falls and Kutlaku Lakes were estimated. Sockeye fry populations were estimated in all three lakes using hydroacoustic and trawl sampling. Light, temperature, and dissolved oxygen profiles were measured and zooplankton populations and species distributions were estimated in all three lakes. About 3,700 adult sockeye salmon returned to Falls Lake in 2002; 2,600 of these were harvested in subsistence fishing, leaving an escapement of about 1,100. Compared with 2001, the total return was smaller and the subsistence harvest higher in 2002, resulting in an escapement of only about 40% of the previous year's number. Sockeye adults with two ocean years dominated the 2002 Falls Lake escapement with 46% of the sample at age-1.2 and 23% at age-2.2, contrasting with the 2001 escapement where almost 90% were age-1.3. About 1,350 sockeye salmon spawned in the main inlet stream of Kutlaku Lake, constituting an unknown portion of the total escapement. Age-1.2 sockeye salmon comprised 75% of the Kutlaku Lake escapement sample. At Falls Lake, the estimated sockeye salmon fry density of about  $0.02 \text{ fry} \cdot \text{m}^{-2}$  was low compared with other Southeast Alaska lakes sampled, and lower than in 2001 (Conitz et al. 2002). Both Gut Bay and Kutlaku Lakes had among the highest sockeye fry densities of lakes sampled in Southeast Alaska in 2002, with about  $0.25 \text{ fry} \cdot \text{m}^{-2}$ , and, relative to the same group of Southeast Alaska lakes sampled in 2001, their fry densities remained about the same in 2001 and 2002. Falls, Gut Bay, and Kutlaku Lakes each had a mean euphotic zone depth between 8 – 9.5 m, developed a summer thermocline, and had adequate levels of dissolved oxygen at least in the upper half of the water column. Zooplankton levels were very low in Falls and Gut Bay Lakes, with total seasonal mean biomass of  $50 \text{ mg} \cdot \text{m}^{-2}$  and  $30 \text{ mg} \cdot \text{m}^{-2}$ , respectively, at the main sampling station, and even lower at the second station. Copepods *Diaptomus* sp. and *Cyclops* sp. were dominant in Falls Lake, while the cladoceran *Bosmina* sp. was dominant in Gut Bay Lake. Zooplankton biomass was 3-4 times greater in Kutlaku Lake, with total seasonal mean about  $130 \text{ mg} \cdot \text{m}^{-2}$  at both sampling stations. The cladocerans

*Bosmina* sp. and *Daphnia longiremis* together constituted over 50% of biomass, but the *Daphnia* were small at 0.5-0.7 mm length. The work performed in 2002 yielded a second year of successful harvest and escapement estimates at Falls Lake, and of lake productivity estimates at all three lakes. These results bring us one step closer to the long-term goal of setting scientifically based, sustainable harvest limits and escapement goals.

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